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ABSTRACT

Activities of a workshop held at Jackson State University on careers for women in the sciences are presented. Findings reported include a conclusion by participants that college level was not the optimal time for receiving science career information. Recommendations are made regarding appropriate ages for female students to receive exposure to science careers and career models. (CS)

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FINAL REPORT OF JACKSON STATE UNIVERSITY'S

Careers for Women in the Sciences Workshop

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NSF WOMEN IN SCIENCE PROGRAM

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Summary

The Jackson State University "Careers for Women in the Sciences" Workshop was held October 12-14, 1978. The two-day Workshop was comprised of a number of activities designed to expose female students to careers in the sciences, career models and career decision-making processes.

Over twenty consulting women scientists participated in the Workshop. These scientists represented the biological, physical, social and behavioral sciences in addition to mathematics, engineering and psychology. The consultants also represented industry, government and academia.

The student participants represented five senior and junior colleges within the State of Mississippi. One hundred sixty-two (162) applications to the Workshop were received and approximately one hundred (100) students participated in various aspects of the Workshop.

The actual activities of the Workshop included an orientation session for the consultants, a general session on career decision-making, small group sessions run by the scientists and a banquet for students, consultants, faculty and the community. The general session was well attended with over four hundred (400) students from Jackson State University in addition to the Workshop participants.

Our general findings indicate that even though our participants found the Workshop stimulating and worthwhile, they did not think that the college level was the most optimal time for them to have received information such as that provided at the Workshop. Further, the data suggested that had the participants received science career information sooner, they perhaps would have considered such careers appropriate for them.

In order that we assure that there shall be an increase in the number of women scientists within the next decade or two, we recommend that the NSF Women In Science Program initiate 1) projects at the junior high school level that are similar in scope to the current career workshops, and 2) demonstration projects to determine the feasibility of exposing elementary school-aged girls to science careers and career models.

Overview

The Jackson State University Women In Science Project began July 1, 1978 and terminated June 29, 1979. Almost immediately the project directors began contacting individual women scientists within the country. At that time, there was an attempt to reach scientists who were in a variety of settings including industry. Concomitantly, an attempt was made to contact scientists who represented the scope of the sciences including mathematics and engineering. Within the time period from July to mid-September, thirty-five women scientists and engineers were approached about their potential participation in the workshop. By September 1[illegible], 1978, twenty scientists and engineers had been identified and had committed themselves to participating in the two-day workshop. The participating consultants represented the biological, physical, social and behavioral sciences as well as mathematics, engineering, and psychology.

The consultants were sent an information packet that included the schedule of events and suggested topics for discussion. On the eve of the workshop, an orientation session was held for the consultants. The purpose of this session was to facilitate a well-run workshop by 1) familiarizing the consultants with the "typical female student" who would be attending the workshop; 2) having the workshop planners and consultants meet and interact around workshop issues; and 3) providing time for consultants who would be working together to confer with each other.

Immediately following the orientation session a reception was held for the consultants. It was felt that it would be important for the Administrators

and science faculty at Jackson State to meet the women scientists in an informal setting.*

On Friday, October 13, the actual workshop began with Dr. Jane Browning delivering an inspiring and informative keynote address entitled "Building My Tomorrow". There were over five hundred (500) students, faculty, and administrators in attendance at this general session. The address was followed by an overview of careers for women in the sciences presented by selected consultants. For the remainder of Friday and Saturday morning, the workshop participants (N = 120) went to small group sessions led by the consultants. The participants had been assigned to particular groups based on their majors and expressed career interests. In these small groups the consultants provided specific information regarding training, job opportunities, income ranges and the balance between career and marriage and family.

In addition to the small group discussions, a banquet was held Friday evening. Dr. Jewell Plummer Cobb delivered the banquet address which, to some degree, focused on the assets and liabilities of being a female, a minority, and a scientist. The banquet was well attended by participants, university faculty, staff, and administrators as well as individuals from the community at-large.

While the actual number of participants was lower than was expected, those who did attend felt that they had obtained a significant amount of information and had experienced meaningful interaction with the consultants, JSU faculty and fellow peers.

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*In some instances, they, like the students had had minimal contact with well-trained, competent scientists, particularly ones who were minority.

Description of What Was Accomplished

Publicity

With the able assistance of the Public Information Office at Jackson State University, the Workshop was well advertised. Dr. Brookins was interviewed on all three local television stations regarding the Workshop. Additionally, she was interviewed on two local radio stations. Further, both co-directors discussed the upcoming workshop in an hour-long interview on a television station in Greenwood, Mississippi (one hundred miles (100) from Jackson). All of this publicity took place at least one month prior to the Workshop.

In addition to media advertising of the Workshop, brochures were developed and disseminated to eleven (11) senior and junior colleges with a one hundred mile radius of Jackson State University. At each institution a faculty contact person was identified to assist in obtaining applicants for the Workshop.

The actual workshop received excellent media coverage. During registration, six women scientists appeared on a local talk show (Coffee with Judy) to discuss the significance of women in the sciences. Three local television stations covered the opening session and one station reported on the Workshop activities during that day's 6 p.m. News Program (WLBT-TV3). Further, three local newspapers covered the Workshop activities and the Jackson Daily News carried a special report in the following day's publication.

Finally and probably most importantly regarding disseminating information on women in science, crews from the Mississippi Authority for Educational Television conducted fifteen-minute (15) interviews with six of the consultants.

These interviews have been aired at various times throughout the year on a program entitled "Faces". This effort, we feel, has been instrumental in furthering the cause of women in the sciences.

Solicitation From Other Sources

In order to assure that the workshop would be broad in scope, we contacted a number of industries and government facilities asking that they provide support for the Workshop by sending some of their women scientists as consultants and assuming the cost of their expenses. The response was very positive. Lawrence Livermore Laboratories provided three (3) consultants; the Polaroid Company and the National Space Technology Laboratory each provided two (2) consultants; and Phillip Morris Company sent one (1) consultant as did the South Central Bell Telephone Company and IBM.

Service and supply contributions were made by the Coca Cola Bottling Company and the Mississippi School Supply Company. Financial contributions were obtained from Dow Chemical Company, IBM, Resource Center for Science and Engineering, Atlanta University, and the Xerox Corporation. Additional funds were obtained from the deans at Jackson State University. These funds were used for activities not approved by the NSF grant guidelines. In general, the generous support given to us by these organizations and individuals attests to a genuine interest in promoting the increase in the number and percentage of women in the sciences, mathematics, and engineering.

Committee Structure and University Involvement

In order to have a number of students from a variety of majors participate in the Workshop activities, we determined that faculty participation from different departments would facilitate this goal. Also, in order to accomplish the many tasks involved in producing a successful workshop, it was apparent

that more than the talents and efforts of the steering Committee was necessary. Therefore, we combined the approach to the two goals by developing six (6) committees whose functions were carefully delineated. Key faculty from various departments were then asked to chair or serve on these committees. The six committees were Hostess, Student Selection, Advertising and Publicity, Banquet, Transportation and Lodging, and Workshop. Twenty-seven individuals representing fourteen departments on the campus participated on the committees.

Administrative involvement included participation of the Deans of the School of Liberal Studies, Education, and Business and Economics. Also, the President and Vice-President for Academic Affairs welcomed our banquet and workshop guests and participants to the University. Additionally, the chairpersons of the science departments were particularly supportive of the Workshop and its goals. The integral involvement of the faculty, staff and administrators at Jackson State contributed to the Workshop's smooth functioning.

ANALYSIS OF DATA

FROM

WOMEN IN SCIENCE APPLICATIONS

One hundred sixty-two applications were received. The applicants were classified according to the data below (see TABLE 1).

TABLE 1

Classification of Applicants for the "Women in Science" Workshop

School	Freshmen	Sophomores	Total
Jackson State University	86	23	109
Tougaloo College	5	8	13
Utica Junior College	4	8	12
Mississippi Valley State Univ.	10	10	20
Prentiss Institute	2		2
University of Southern MS.	1	1	2
Millsaps College		3	3
Alcorn University	1	—	1
TOTAL	109	53	162

The majority (92%) of the applicants completed high school in Mississippi. The remaining 8% graduated from schools in the following states: New Jersey, Colorado, Tennessee, Illinois, Maryland, and Ohio.

There was no established pattern of major and minor areas (see Table 2). Some students were majoring in scientific areas while minoring in areas relating to fine arts. The converse was also evident. Many students had both major and minor areas relating to medical careers. The extent of preparation for a scientific career upon emission from college appears to be restricted. Realistically many pre-medical students will not be accepted into the medical schools which they are training to enter. Hence, the question arises as to what extent the students are prepared to pursue a variety of scientific careers.

TABLE 2

Reported Major and Minor Areas

n = 157

Course	Major	Minor
Chemistry	10	2
Nursing	9	2
Computer Science	17	5
Pre-Med or Dentistry	10	15
Accounting	8	2
Mathematics	4	15
Business	8	3
Finance	2	
Medical Technology	2	1
Engineering	2	2
Mass Communications	6	1
Political Science	6	
Psychology	2	5
Biology	35	6
Science	1	
Technology	2	
Social Work	4	
Environment	1	
Journalism		1
Physical Science	2	
Social Science	2	

TABLE 2 continued

Course	Major	Minor
Physics	3	
Sociology	1	1
Economics	1	
Music	1	3
Criminal Justice	2	2
Early Childhood	1	1
Elementary Education	2	
Physical Education	1	
Physical Therapy	4	2
Audio-Visual		1
Business Education	1	
Marketing	3	
Speech Pathology	1	
Special Education	1	1
Dancing		1
Electronics	1	
Pre-Law	1	
Radio		1
Art		1

A comparison of the data in Table 3 and Table 4 shows some evidence of the tendency for required scientific courses in the high schools which the applicants attended not to correspond to the required scientific courses of the colleges the applicants are currently attending. Biology is the only scientific course which is required by a majority of the high schools and

colleges represented in the study. Yet, most students completing the survey indicated other science and mathematics requirements at the college level. Hence, the evidence tends to support the fact that the foundation courses needed to pursue a scientific career are not mandatory in high school. This fact concurs with studies done by Gray (1976, University of Southern Mississippi and 1978, Jackson State University).

TABLE 3

REPORTED SCIENTIFIC COURSES AT THE HIGH SCHOOL LEVEL

n = 135

Course	(E-R) No Indication	Elected	Required
Algebra I	5	52	37
Algebra II	2	48	17
Geometry	2	57	13
Advanced Mathematics	2	25	6
Biology	4	38	55
Advanced Biology	1	12	2
Chemistry	3	49	14
Advanced Chemistry		6	
General Mathematics I	1		36
General Mathematics II	1	4	6
Physical Science		1	1
General Science	1		
Physics	1	23	14
Physical Science	2	5	11

TABLE 4

*REPORTED COLLEGE COURSES
n = 76

Course	(E-R) No Indication	Elected	Required
Biology	3	3	16
Zoology	3	1	20
Chemistry	3	4	24
Algebra	4	7	29
Trigonometry	2	7	13
Botany		2	4
Calculus			7
Physics		2	2
Physical Science	1		6
Business Mathematics			1
General Mathematics	2	2	16
Basic Mathematics			1
Organic Chemistry			4
Micro-Biology			2
Anatomy	1	1	4
Cytology	3		1
Computer Science		1	6
Analytic Geometry			1
Psychology			1
Cobolt			1

*Many freshmen did not have college courses indicated.

Gray (1978) found that the psychological impact of poor high school preparation was evident when the students expressed the frustrations they experienced in their major areas because of their inability to do well in their mathematics courses. Most students in the study who changed their major, had been in a scientific area. A large percentage (75%) of the students in the study felt they lack sufficient knowledge to select the high school courses which facilitate a sufficient foundation for scientific majors.

The data indicate a need for workshops and other activities prior to curriculum selection in high schools to assist students in forming a broader scientific foundation prior to entering college. Possibly, a junior high school area of the Women in Science Workshops should be incorporated into the college activities so that students can receive some idea as to the courses needed in high school to pursue a broader spectrum of careers by choice and not by necessity.

Evaluation

Pre Workshop

The student participants were presented with a pre-workshop questionnaire. In addition to assessing various attitudes the participants had about women in the sciences, the questionnaire also elicited some general information regarding career choice.

Results. Similar to other reports (Pallone, Hurley and Rickard, 1973; Pallone, Rickard, and Hurley, 1970) our participants ranked parents as being the most influential in their career choice with individuals within specific occupations having the second highest percentage. (See Table 1).

Table 1

Influencing Factors, Strongest Rank 1

n	Variable	Percentage
29	Parents	35.8
15	Individuals	18.5
10	Written Information	12.3

Five factors received nearly even percentage distribution as the second ranked influential factor for career choice. These were parents, teachers, counselors, individuals in occupations and potential income (See Table 2).

Table 2

Influencing Factors, Strongest Rank 2

n	Variables	Percentage
13	Parents	16.2
14	Teachers	17.5
14	Counselors	17.5
11	Individuals	13.7
12	Potential income	15.0

Parents also received the highest percentage for those factors ranked third in influence. Potential income received the second highest percentage in this rank (see Table 3).

Table 3

Influencing Factors, Strongest Rank 3

n	Variables	Percentage
23	Parents	28.0
12	Teachers	14.6
13	Individuals	15.9
16	Potential income	19.5

Ninety-five percent (95%) of the participants responding indicated that they had given a substantial amount of thought to what is involved in making a career decision. A majority of the students indicated that the 9th and 10th grades are the most important years for receiving career data (see Table 4). Only 10.3% of the participants indicated that the freshman and sophomore years of college were appropriate times to receive career information.

Table 4

Most Important Time for Career Data

n	Variables	Percentage
15	Junior High	17.0
33	9th and 10th grades	37.5
27	11th and 12th grades	30.7

The students were asked to indicate the number of different scientific areas with which they were familiar. Almost one half (48.3%) were only familiar with two to four areas associated with the sciences (See Table 5). Although familiarity with scientific areas was not extensive, 78.6% of eighty participants responding indicated that they personally knew women in a scientific field.

Table 5

Knowledge of Scientific Areas

n	Number of Areas	Percentage
42	2 to 4	48.3
19	5 to 7	21.8
15	8 to 10	17.2

Regarding attitudes, 49.4% of the participants (n = 87) felt that some careers were more suitable for men than for women. Even though many participants expressed a belief that some discrimination between careers for males and females existed, over ninety-six percent (96.6%) of them felt that women need careers. Over sixty-two percent (62.5%) of 88 participants did not feel

that science careers were inappropriate for women. With respect to counseling procedures in high school, 45.5 percent of the participants indicated that counselors guided females into certain careers and not others. Thirty-two percent (32%) indicated that counselors made no sex distinctions regarding career guidance. Seventy-seven percent (77%) of 87 participants indicated that marriage and careers were compatible roles for women. Eighty-four percent (84%) of the participants indicated that established career women should assist younger women in their career development. While ninety-five percent (95%) of the participants felt that women were capable of handling jobs in science and technology, seventy-five percent (75%) indicated that acceptance of women in jobs primarily held by men was generally poor. Also, sixty-three percent (63%) of the students felt that women scientists did not receive adequate recognition for their contributions to the field even though women had made achievements in science.

Post-Workshop

The student participants were asked to evaluate the Workshop in terms of its being a valuable experience for them. They were also asked to indicate the most effective and least effective aspects of the Workshop.

Decision-making Session. After attending the decision-making session eighty percent (80%) of fifty-five (55) participants felt that they had adequately considered their career goals. When asked to evaluate the strongest aspects of the decision-making session, fifty-three percent (53%) ranked the keynote speaker as number one, forty-three (43%) ranked information provided as number two, and twenty-seven percent(27%) ranked the question and answer period as number three. The factor ranked as weakest was time. Many of the subjects felt that the session should have been longer.

Small-Group Sessions. Of fifty-two (52) participants, ninety-six percent (96%) felt that the small-group sessions were helpful. When asked to evaluate the strongest aspects of these sessions,seventy-three of the students ranked the women scientists as number one, and fifty-percent (50%) ranked information provided as number two. Fifty-one percent (51%) of the participants ranked time as the weakest aspect of the small group sessions. Many indicated that these sessions should have been longer in duration.

General Impressions. Eighty-two percent (82%) of fifty-six (56) participants indicated that they could think of the women scientists as models for their own career. Gains of new information regarding scientific areas were indicated by the fact that fifty-four percent (54%) of fifty-six (56) participants noted that they had acquired new information in two to four areas, and thirty-three percent (33%) indicated gains in five to seven new scientific areas. Most participants (80%) expressed a need to have received the workshop information earlier in their education.

Of fifty-one (51) students responding, seventy percent (70%) indicated that their attitudes toward women, careers, and science had changed as a result of attending the Workshop. Regarding the overall impact of the Workshop, forty percent (40%) felt that they had gained insight into how women can make it in science and twenty-five percent (25%) indicated that general information was the most impressive to them.

Consultants. The consulting women scientists were asked to evaluate the following aspects of the Workshop: workshop structure, planning, staff, student participation and the scope of the workshop. Regarding the workshop structure, seventy percent (70%) of the consultants rated it "excellent". Planning was rated "excellent" by sixty-five percent (65%) of the consultants and rated "good" by thirty-five percent (35%). Eighty-two percent (82%) of the consultants rated the staff as "excellent". Student participation was rated "excellent" by ten percent (10%), "good" by fifty-three percent (53%) and "average" by thirty-five percent (35%) of the consultants. The scope of the workshop was rated "excellent" by eighty-two percent (82%) and "good" by eighteen percent (18%) of the women scientists.

The women scientists noted that the range, diversity, and expertise of the consultants, prior planning of the Jackson State hosts, enthusiasm and participation of the students and the keynote address respectively, contributed to an effective workshop. While most of the consulting scientists did not feel that there were any factors that contributed to an ineffective workshop, some indicated the level of student participation was less than desirable.

The following is illustrative of the general comments made by the consultants:

> "My congratulations to the organizers of this affair--and the calibre and enthusiasm of the students I met. A very with it group of girls - they seem to have a good sense of self and reliastic priorities."
>
> "I think this work was well-planned, staffed and fairly well attended by students. I am sure it has helped some young ladies by giving them necessary information to succeed."
>
> "The logistics were well worked out. There was attention given to detail which made me feel very comfortable with the workshops. The main speakers were quite good. However, I would liked to have seen more student participation (i.e., larger numbers in the general session)."

Finally, seventy-percent (70%) of the consultants gave the Workshop an overall rating of "excellent" and thirty percent (30%) rated it "good".

General Discussion and Recommendations

It is our opinion that the Jackson State University "Careers for Women in the Sciences" Workshop was very successful. However, given the information provided by the student participants and our general concern regarding the current and projected number of women in science careers, it appears rather obvious that the focus of the NSF Careers in the Sciences Workshops should be modified to some degree. Specifically, ninety-five percent (95%) of our participants indicated that they felt they had given adequate consideration to their career goals prior to attending the Workshop, and in many cases, prior to coming to college. However, most of the participants evidenced minimal familiarity with and knowledge of careers in the sciences. Thus, it would appear that in many cases, science careers are not generally considered in the career decision-making process for these young women. Moreover, many of our participants suggested that an optimal time for receiving information regarding careers is prior to the college level. Therefore, if our participants are in any way representative of female students across the Nation, it would seem that the NSF Women In Science Program is targeted at the wrong age cohorts. If we plan to increase the number and proportion of women scientists in the United States, then it behooves us to introduce females to science, careers, and career role models long before the freshman year in college. Further, because the courses taken (or not taken) in high school to a large degree dictate majors selected in college and, subsequently, careers in the workforce, it is important to at least direct some of our efforts to females in junior high school, or if possible elementary school. To underscore this stance, we point to our own data which indicate that even though many participants were excited

about and inspired by the information they had received from the workshop, they were not willing to alter their current career plans. Such an alteration would require that they spend extra years in college in order to obtain the requisite foundations for different careers. Hence, they merely indicated that they wished that they had received the workshop information earlier in their education. It is entirely probable that potential, talented women scientists have been lost to other disciplines simply because of a lack of synchronization between the timing of providing science career information and the occurrence of primary decision-making.

In light of the above concerns,we are introducing two recommendations. First, we recommend that the NSF Women In Science Program shift their general focus downward, beginning in junior high school. This is not to suggest that the college and post-baccalaureate programs be discontinued, rather it is suggested that such programs build upon and reinforce the basic programs designed for younger females. Our second recommendation is more research-oriented and long-ranged. It is based on current knowledge of attitude formation, female career-choice patterns, and the probable interface of the two. In brief, it is well-established that females tend to foreclose early on career options. Further, it is widely held that most attitudes that individuals hold are formed early in life and maintained overtime with little alteration. Additionally, for reasons known and speculated, girls tend to adopt negative attitudes toward math and science. Given this information, the issue of optimal intervention must be addressed if the increased participation in the sciences by women is to be attained. That is, information is needed regarding when female children are more likely to form attitudes toward science and math and, concomitantly, what are the most appropriate times for and methods of introducing them to role

models and careers in the sciences. Further, because parents are perceived to be the most influential agents in youths' career decision-making processes, we should consider designing programs for girls that integrally involve and educate parents to science careers as well. We therefore recommend that the NSF Women In Science Program initiate demonstration projects that would seriously address these issues.

Finally, we feel, in order to increase the numbers of minority women in the sciences, mathematics and engineering, the above-mentioned efforts are even more imperative. We also contend that the role of career role models is of utmost importance to young minority females. In order to assure that interaction between minority women scientists and young female students takes place, it is important that these scientists be involved in all phases of the NSF Women In Science Program.